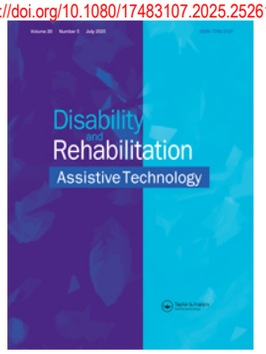

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RESEARCH ARTICLE

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Digital health technology adoption factors: a rapid review of systematic reviews and checklist development

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ABSTRACT

Objective: This rapid review of systematic reviews aimed to synthesize the adoption factors of digital health technologies (DHTs).

Methods: A reference search was performed on MEDLINE, EMBASE, CINAHL, PsychInfo, PubMed, EBM Review, Web of Science, Scopus, PROSPERO and Google Scholar to search systematic reviews published in the last three years. Study selection was conducted following the PRISMA guidelines. The methodological quality of the included systematic reviews was assessed with the AMSTAR 2 tool. The identified adoption factors were classified using the Nonadoption, Abandonment, Scale-Up, Spread, and Sustainability (NASSS) framework, in which the self-determination factors were integrated.

Results: Out of 4277 identified references, 45 systematic reviews were retained. The quality of most included systematic reviews, assessed by AMSTAR 2, was critically low. The most cited adoption factors included *DHT's ease of use, training for using DHT, adopters' access to DHT and a high-speed internet connection, technical support, DHT's customizability, the relevance and reliability of DHT data, the demand-side value of DHT (desirability), safety, cost-effectiveness, staff and patient competence, patient relatedness with others, organizational readiness, necessary changes in team routines, capacity for innovation*, along with *the political, economic, regulatory and sociocultural contexts*. Integrating the findings of this rapid review, a DHT adoption checklist was elaborated. This checklist would aid future developers and implementers of DHT in successfully adopting the technology.

Conclusions: This review synthesized the DHT adoption factors using the NASSS framework and Self-Determination Theory. When developing or implementing a DHT, the micro-, meso- and macro-level adoption factors must be considered.

IMPLICATIONS FOR REHABILITATION

- When developing or implementing a digital health technology (DHT) to support patients' rehabilitation, various adoption factors must be considered at the micro, meso and macro levels, namely, DHT's ease of use, training for using DHT, adopters' access to DHT and a high-speed internet connection, technical support, DHT's customizability, the relevance and reliability of DHT data, the demand-side value of DHT (desirability), safety, cost-effectiveness, staff and patient competence, patient relatedness with others, organizational readiness, necessary changes in team routines, capacity for innovation, along with the political, economic, regulatory and sociocultural contexts.
- The DHT adoption checklist elaborated based on the NASSS framework, Self-Determination Theory and the findings of this review would facilitate successful DHT implementation for future DHT developers and implementers.

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KEYWORDS
Self-determination; digital health technology; adoption; implementation; rapid review of systematic reviews; NASSS framework

Introduction

In 2005, the World Health Organization highlighted the importance of developing a digital health infrastructure to improve universal access to healthcare [1]. Since then, digital health technologies (DHTs) have been increasingly solicited to alleviate our

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healthcare systems and better meet people's needs. DHTs have the potential to save healthcare costs, facilitate access to care services and reduce feelings of isolation [2]. They can assist with diagnostic and treatment decisions, monitor clinical conditions and share patient records among clinical institutions [3]. According to the National Institute for Health and Care Excellence (NICE), DHTs can be classified based on their intended use [4]. DHTs classified in Tier A are designed to save costs or free up staff time but are unlikely to yield measurable patient health outcomes [4]. Electronic health record systems fall into this category. DHTs in Tier B help individuals manage their health and wellness, communicate with healthcare providers or others and promote healthy lifestyles. Examples of this tier include digital care platforms and instant messaging apps for health tracking. DHTs classified under Tier C assist healthcare providers in diagnosing, treating medical conditions or guiding care decisions [4]. This category includes clinical decision support systems. DHTs of Tiers B and C are, therefore, intended to directly improve health-related outcomes of patients or individuals. These DHTs include telemedicine, mHealth, wearable technologies, assistive living technologies and socially assistive robots [3,5–7]. Telemedicine provides healthcare services where patients and providers are separated by distance using the internet [8,9]. mHealth is a telemedicine supported by mobile devices such as smartphones or tablets [5]. Wearable technology is a category of electronic devices worn or carried on the body, such as an e-Textile or a smartwatch [5,6]. Assistive living technologies refer to a DHT that "people can use to live independent and healthy lives by maintaining or improving the functioning needed for daily activities" [10].

Interestingly, some DHTs are more readily adopted than others. Several frameworks have been developed to explain this phenomenon. Some focus on a micro level, that is, individual users level (e.g., age, sex, motivation, experience) [11–14] and another is a meso level, i.e., organizational systems such as a hospital or a healthcare system [15]. Yet, the micro and meso level

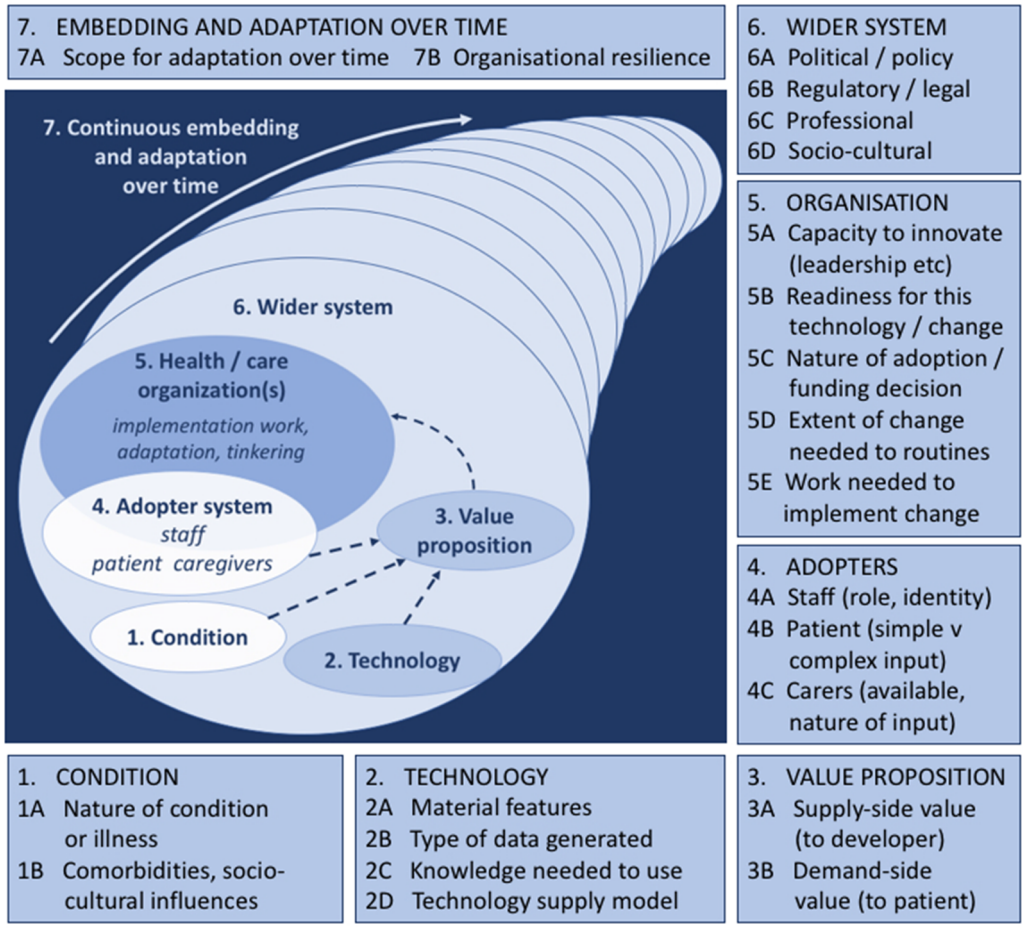

Figure 1. The Nonadoption, Abandonment, Scale-Up, Spread, and Sustainability (NASSS) framework [16] [©Trisha Greenhalgh, Joseph Wherton, Chrysanthi Papoutsi, Jennifer Lynch, Gemma Hughes, Christine A'Court, Susan Hinder, Nick Fahy, Rob Procter, Sara Shaw. Originally published in the Journal of Medical Internet Research (http://www.jmir.org), 01.11.2017].

factors are tightly influenced by a macro level factors such as society and policy and other way around. To better understand DHT adoption, these three level factors should be considered [16–18]. The *Nonadoption, Abandonment, Scale-Up, Spread, and Sustainability (NASSS) framework* [16] (Figure 1) examines the dynamic interaction between individual factors at a micro level and the DHT implementation environment at meso and macro levels. The NASSS framework considers seven adoption domains, namely: (1) condition or illness, (2) technology, (3) value proposition, (4) adopters, (5) organization, (6) wider system and (7) embedding and mutual adaptation over time. This framework was elaborated through a hermeneutic systematic review of technology implementation frameworks and ethnographic studies of six DHT implementation projects [16]. The framework has been empirically tested and provides a predictive value for adopting a specific DHT in each context, either simple, complicated, or complex, thus serving as a helpful tool [16]. However, enhancing its Domain 4 (Adopter system) would be more relevant. This domain is meant to predict the level of DHT adoption by considering the complexity of tasks required to use the DHT, rather than the adopters' characteristics. When no tasks are required, DHT adoption is predicted to be simple. When routine tasks are required, such as logging in, entering data and engaging in conversations, the DHT adoption is predicted to be more complicated. If the adopters must carry out complex tasks like initiating changes in therapy or making judgments, the DHT adoption is expected to be intricate. However, motivation [13,17,18] and competence in using DHT are also important adoption factors, therefore, they need to be included when to implement DHTs [11,18]. According to Ryan and Deci [19,20], the self-determination components—motivation, competence/autonomy and relatedness with others—are critical mediators of improving health outcomes. These factors enhance adherence to new behaviors that will improve health conditions [21]. For instance, motivation to improve health might lead to adopting a healthy lifestyle, such as daily walking, The motivation is potentially reinforced by positive self-efficacy (competence) regarding walking. The motivation to adopt this behavior may be amplified when encouraged by significant persons, such as healthcare professionals, family, or peers [21]. This factor is known as relatedness with others. Therefore, it is essential to consider adopters' motivation to use the DHT, their competence in utilizing it and their connections to significant others when implementing a DHT. Thus, we believe that incorporating the self-determination constructs into Domain 4 of the NASSS framework is crucial.

Therefore, this review's purpose was to synthesize the adoption factors of DHTs categorized into Tier B and C of the NICE classification at the micro, meso and macro levels documented in the systematic reviews using the NASSS framework, modified by integrating the self-determinant factors (see Supplementary Appendix A).

Materials and methods

Ethics approval was not required for this study, as it used exclusively publicly available information, which does not involve any reasonable expectation of privacy. Given the abundance of systematic reviews that explore DHT adoption factors, we have opted for a rapid review [22,23] of systematic reviews. A rapid review, although less vigorous than umbrella reviews whose methodology is well established [24], allows for the rapid synthesis of evidence and is less costly; thus, it is useful when decision-making is necessary in the short term [25]. The selection process of relevant reviews was presented using the PRISMA 2020 statement [26] (Figure 2).

Literature search

A comprehensive reference search was conducted on PubMed, Scopus and PROSPERO by the first author, while an experienced librarian searched the MEDLINE, EMBASE, CINAHL, PsychInfo, Cochrane Database of Systematic Reviews, Web of Science and Google Scholar databases. The following key concepts were combined: (1) health or healthcare or care, (2) implementation or adoption or facilitator or barriers, (3) conceptual framework or framework or model or theory, (4) technology or innovation and (5) systematic reviews. An example of the research strategy for MEDLINE is presented in Supplementary Appendix B.

Study selection

The eligibility criteria are outlined in Table 1. The target populations of this review include adults and older adults (≥19 years old) as well as healthcare professionals (staff). Children were excluded because their DHT use is largely influenced by their parents or guardians. The targeted interventions focused on using a DHT to improve health outcomes. Thus, the types of DHT are classified in Tiers B and C, according to the NICE classification [4]. The outcomes of interest include factors influencing DHT adoption (facilitators or obstacles). The studies included in this review were systematic reviews that incorporated the implementation studies. Systematic reviews that included other types of reviews (e.g., literature reviews) or expert

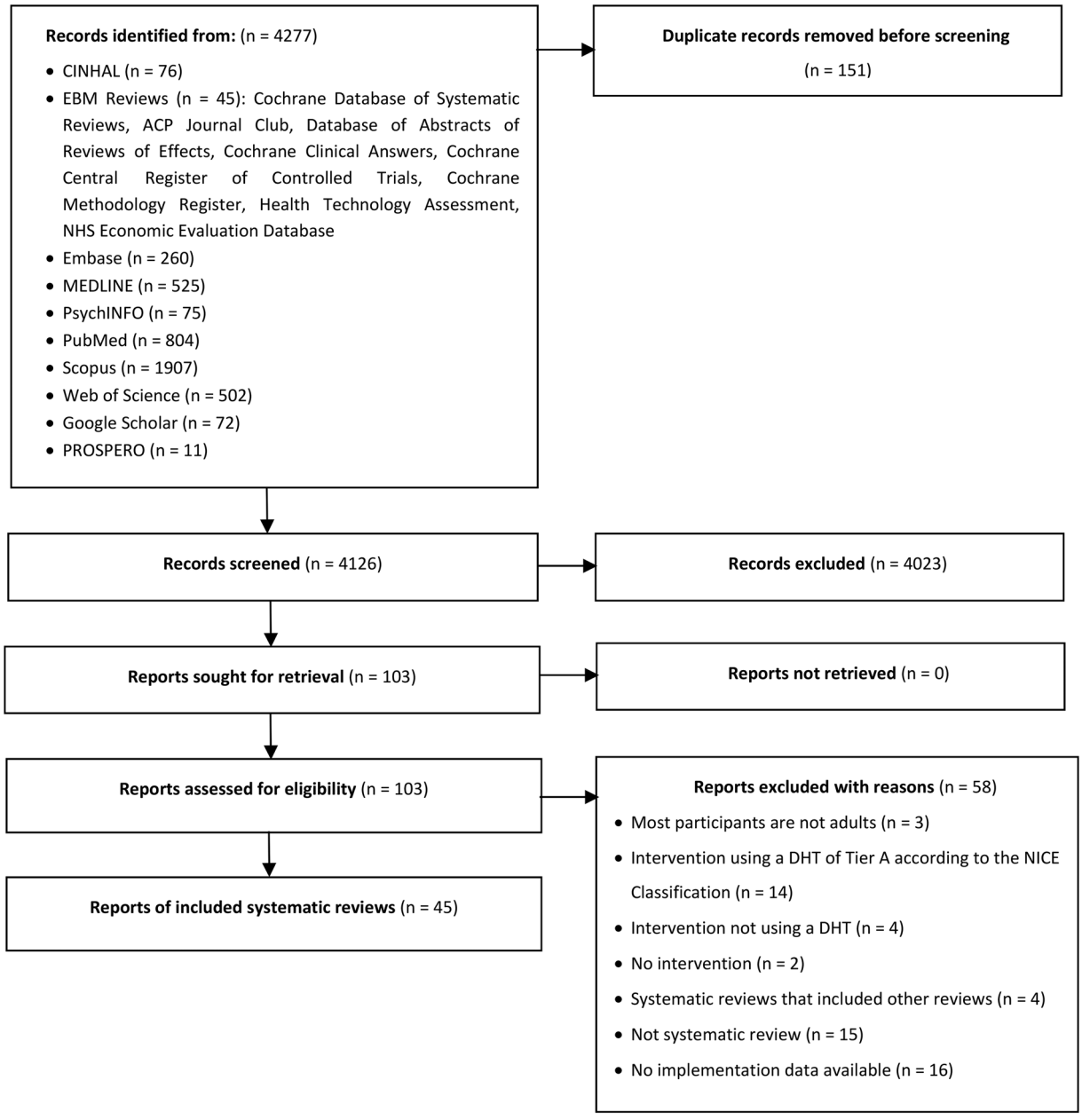

Figure 2. Flow diagram of the study selection.

Table 1. Inclusion/exclusion criteria.

Inclusion criteria	Exclusion criteria
• Adults (19+ years), older adults (65+ years), their caregivers and/or health professionals. • Healthcare, rehabilitative, or psychosocial interventions using a DHT of Tier B or C of the NICE Classification. • Systematic review including primary studies. • Reported adoption factors of DHT (facilitators and/or obstacles to adoption). • Published in the last three years. • Written in English or French. • Full-text available.	• Majority of participants were children (0–18 years), their caregivers and/or health professionals. • Intervention without using DHT. • Intervention using a DHT of Tier A (e.g., electronic medical records). • Scoping reviews, literature reviews, umbrella reviews, systematic reviews including other systematic reviews or other types of reviews or expert opinion. • Published before March 2020.

opinions were excluded. Umbrella reviews were also excluded to prevent redundancy. The publication years were limited to three due to the rapid evolution of DHTs and the exponential growth in DHT-related publications since the COVID-19 pandemic [27]. The first author screened titles and abstracts of studies against the eligibility criteria using the reference management software EndNote, retrieved full-text copies of potentially relevant records and assessed their eligibility based on the selection criteria. The third author reviewed the full-text copies to verify their eligibility. Any disagreements between the two authors were discussed with the second author to reach a consensus.

Methodological quality appraisal

Two persons independently assessed the methodological quality of the included systematic reviews by using the tool *Assessing the Methodological Quality of Systematic Reviews* (AMSTAR 2) [24,28] (Figure 3). In cases of disagreement, the first author evaluated the

AMSTAR criterion / Systematic Review (First author, year of publication)	1. Did the research questions and inclusion criteria for the review include the components of PICO?	2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the	3. Did the review authors explain their selection of the study designs for inclusion in the review?	4. Did the review authors use a comprehensive literature search strategy?	5. Did the review authors perform study selection in duplicate?	6. Did the review authors perform data extraction in duplicate?	7. Did the review authors provide a list of excluded studies and justify the exclusions?	8. Did the review authors describe the included studies in adequate detail?	9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	10. Did the review authors report on the sources of funding for the studies included in the review?	11. If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	12. If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or	13. Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?	14. Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	15. .If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its	16. Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	Overall quality
Abbaspur-Bahbahani 2022	Y	P	N	N	N	Y	N	P	P	N	NA	NA	N	Y	NA	Y	Critically low
Airola 2021	Y	N	N	P	N	N	N	P	N	N	NA	NA	N	N	NA	Y	Critically low
Ajrawat 2021	Y	P	N	P	Y	Y	N	N	Y	Y	NA	NA	Y	Y	NA	Y	Critically low
Al-Rawashdeh 2022	Y	P	N	N	N	Y	N	N	N	N	NA	NA	Y	N	NA	Y	Critically low
Alsahli 2023	Y	P	N	N	Y	Y	N	N	Y	N	NA	NA	Y	N	NA	Y	Critically low
Appleton 2021	Y	P	N	P	Y	N	N	N	Y	N	NA	NA	Y	N	NA	Y	Critically low
Chen 2022	Y	P	N	P	Y	Y	N	Y	P	N	NA	NA	Y	Y	NA	Y	Critically low
Cho 2021	Y	N	N	P	N	N	N	P	P	N	NA	NA	Y	N	NA	Y	Critically low
Davies 2020	Y	P	N	N	N	Y	N	P	Y	N	NA	NA	N	N	NA	Y	Critically low
Dovigi 2020	Y	P	N	P	N	N	N	N	N	N	NA	NA	Y	N	NA	Y	Critically low
Galavi 2021	Y	P	N	P	Y	Y	N	N	Y	N	NA	NA	Y	N	NA	Y	Critically low
Goodman 2022	Y	P	Y	Y	Y	Y			Y	N	NA	NA	Y	N	NA	Y	Low
Hareem 2023	Y	P	N	P	Y	Y	Y	Y	Y	N	NA	NA	Y	N	NA	Y	Critically low
Hasnan 2022	Y	P	N	N	Y		N	P	Y	N	NA	NA	N	N	NA	Y	Critically low
Hayavi-Haghighi 2023	Y	P	N	N	Y	Y	N		Y	N	NA	NA	Y	N	NA	Y	Critically low
Hopstaken 2021	Y	P	N	N	Y	Y	N	P	Y	N	NA	NA	Y	Y	NA	Y	Critically low
Jain 2020	Y	N	N	N	Y	Y	N		Y	N	NA	NA	N	Y	NA	Y	Critically low
Kaboré 2022	Y	P	N	N	Y	Y	N		Y	N	NA	NA	Y	N	NA	Y	Critically low
Kavandi 2020	Y	N	N	P	N	N	N	N	N	N	NA	NA	N	N	NA	Y	Critically low
Marques 2022	Y	P	N	Y	Y	Y	N	Y	P	N	NA	NA	Y	Y	NA	Y	Critically low
Meunier 2022	Y	P	N	N	Y	Y	N	N	Y	N	NA	NA	N	Y	NA	Y	Critically low
Miao 2022	Y	Y	Y	P	Y	N	N	P	Y	N	NA	NA	Y	Y	NA	Y	Low
Moore 2021	Y	N	N	Y	N	N	N	N	Y	N	NA	NA	Y	Y	NA	Y	Critically low
Moschonis 2023	Y	Y	N	P	Y	Y	Y	P	Y	Y	NA	NA	Y	Y	NA	Y	Critically low
Neibling 2021	Y	P	N	N	Y	Y	N	P	Y	N	NA	NA	N	Y	NA	Y	Critically low
Ning 2022	Y	P	N	N	N	Y	Y	N	Y	N	NA	NA	Y	N	NA	Y	Critically low
Papadopoulos 2020	Y	P	Y	P	Y	Y		P	Y	N	NA	NA	Y	Y	NA	Y	Low
Parkes 2022	Y	P	N	P	Y	N	N	N	P	N	NA	NA	Y	Y	NA	Y	Critically low
Perlmutter 2022	Y	P	N	N	N	Y	N	N	N	Y	NA	NA	N	N	NA	Y	Critically low
Siopis 2023	Y	P	N	P	Y	Y	Y	N	Y	Y	NA	NA	Y	N	NA	Y	Critically low
Sung 2022	Y	P	N	N	Y	Y	N	Y	Y	N	NA	NA	Y	N	NA	Y	Critically low
Svendsen 2020	Y	P	Y	N	Y	Y	N	N	Y	N	NA	NA	N	N	NA	Y	Critically low
Szinay 2020	Y	P	N	N	N	N	N	N	Y	N	NA	NA	Y	N	NA	Y	Critically low

Figure 3. Methodological quality of the included systematic reviews based on AMSTAR 2 [28].

Tagegne 2022	Y	P	N	N	N	Y	N	N	Y	N	NA	NA	Y	N	NA	Y	Critically low
Thijssen 2021	N	N	N	P	N	N	Y	N	N	N	NA	NA	Y	N	NA	N	Critically low
Tumma 2022	Y	N	N	P	N	N	N	N	N	N	NA	NA	N	N	NA	Y	Critically low
Van der Vegt 2023	Y	P	N	N	Y	Y	N	N	Y	N	NA	NA	Y	P	NA	Y	Critically low
Vandemeulebroucke 2021	Y	N	N	N	Y	Y	N	P	Y	N	NA	NA	Y	N	NA	Y	Critically low
Whitehead 2023	Y	N	N	N	Y	Y	N	N	Y	N	NA	NA	N	Y	NA	Y	Critically low
Williams 2021	Y	N	N	N	Y	Y	N	N	N	N	NA	NA	N	N	NA	Y	Critically low
Wosny 2023	Y	P	Y	P	Y	Y	N	N	Y	N	NA	NA	N	N	NA	Y	Critically low
Ye 2023	Y	Y	N	N	Y	Y	N	P	Y	N	NA	NA	Y	Y	NA	Y	Critically low
Yi 2021	Y	P	N	N	Y	N	N	P	Y	N	NA	NA	N	Y	NA	Y	Critically low
Zakerbasali 2021	Y	P	N	N	Y	Y	N	N	N	N	NA	NA	N	N	NA	Y	Critically low
Zander 2021	Y	P	N	Y	Y	Y	N	N	Y	N	NA	NA	Y	N	NA	Y	Critically low

Y Yes (the criterion is met). P Partially yes (the criterion is partially met). N No (the criterion is not met). NA Not applicable

Figure 3. (Continued)

study. AMSTAR 2 consists of 11 questions that examine the quality of a systematic review. Its inter-rater reliability for each item ranges from moderate to perfect (0.51< kappa <1.00) and is excellent for the global score (kappa = 0.84, 95% confidence interval (CI) 0.67–1.00). Its construct validity (Pearson coefficient) stands at 0.72 (95% CI 0.53–0.84). The minimal detectable difference is 0.64 [28].

Extracting data

The first author collected information regarding the authors, publication year, study locations of the primary studies, DHT, study population and adoption factors in Microsoft Excel. The data including the authors, publication year, study locations of the primary studies, DHT and study population were extracted.

Data analysis/synthesis

Two authors separately classified the facilitators and barriers to DHT adoption using the modified NASSS codes (see Supplementary Appendix A). In cases of divergence between two authors, the second author was consulted. The subdomains 1B, 2A, 2B, 2C, 3B, 4A, 4B and 6A were further divided when specific factors repeatedly emerged. For instance, subdomain 1B ("What are the relevant sociocultural factors and comorbidities?") was expanded to include the following subthemes: comorbidities, age, sex, ethnocultural issues, education/literacy, regionality (urban/rural), regular digital technology usage and employment status (see Supplementary Appendix D).

Results

A total of 4277 references were retained after duplicates were eliminated (Figure 2). After screening the eligibility criteria for titles and abstracts, 103 references remained. Following the full-text examination, 45 reports were retained and 58 were excluded (see Supplementary Appendix E for reports excluded with reasons). From the 45 systematic reviews, 1278 primary studies were included.

Description of the included studies

The characteristics of the systematic reviews are described in Supplementary Appendix C. Many systematic reviews targeted populations with specific health conditions, caregivers and/or healthcare providers. These conditions include acquired brain injuries [29–31], cancer [32,33], sepsis [34], chronic diseases (e.g., diabetes, hypertension) [35–39], musculoskeletal conditions [40–42], dermatological conditions [43,44], cognitive impairments [45] and mental health issues [46,47]. Other reviews examined DHT within healthcare systems in low- and middle-income countries (e.g., China, Ethiopia, Ghana, Jordan, Kenya, Malawi, Nigeria, Rwanda, Senegal, Tanzania and Uganda) [48–50] or conflict-affected regions (Afghanistan, Gaza, Iraq, Libya, Syria and Yemen) [51]. Some reviews focused on specific populations, such as older adults with or without health problems [2,45,52–59], cultural and linguistic minorities (including immigrants, refugees and indigenous populations) [60,61] or particular healthcare disciplines (primary care providers, secondary care providers, hospitals, pharmacists and nurses) [62–66].

The identified DHTs comprise various categories: web-based platforms (e.g., telerehabilitation, telestroke network, web-based psychotherapy, clinical decision support, electronic symptom self-reporting systems, e-Prescribing) [2,29–46,48–52,57,58,60–68], mHealth (e.g., mobile health apps) [2,29,31,33,37–40,42,43,46,49–52,56,58,60,61,64,67–71], monitoring systems (e.g., blood pressure, glucose, medication adherence)

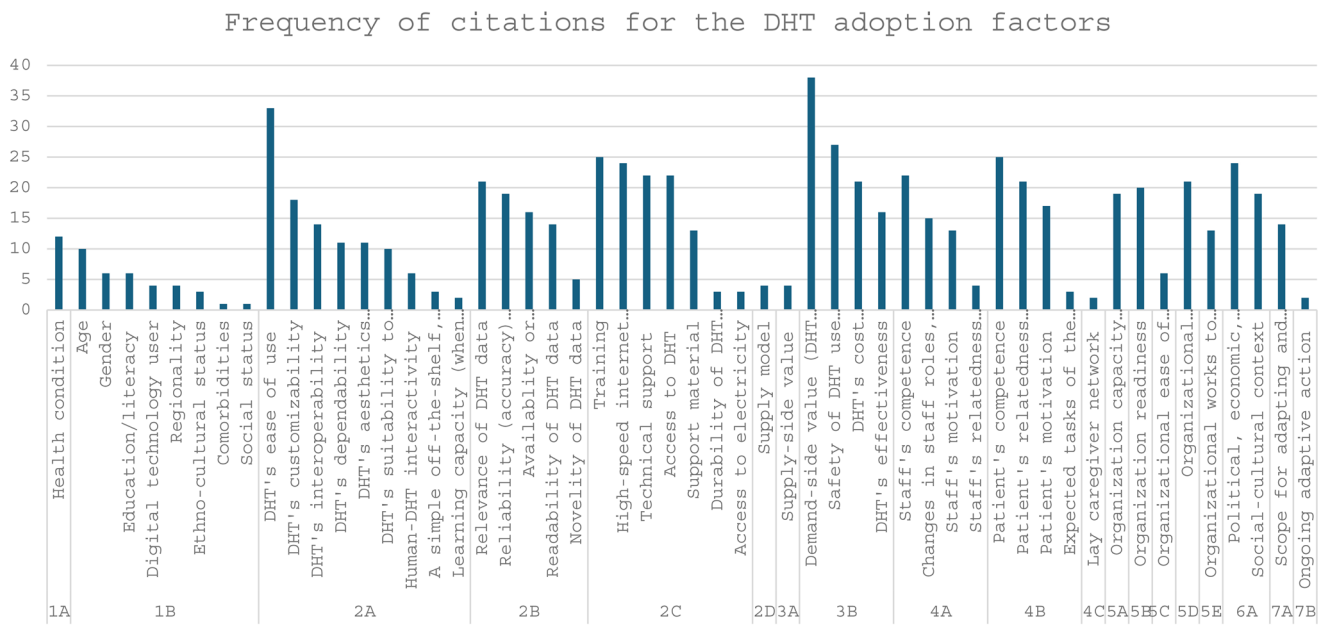

Figure 4. Number of citations for each digital health technology (DHT) adoption factor.

[2,38–40,48,52,57,64,65,68,72], assistive technologies (e.g., socially assistive robots) [2,52,54,59,64], ambient awareness technology [2], wearable technology (e.g., pedometers) [53,57,64,67,68,72] and virtual reality (e.g., exergaming) [29,31,55].

Most primary studies were conducted in the USA (443 studies), Australia (115 studies), the UK (99 studies), Canada (82 studies), China (56 studies), the Netherlands (55 studies), Sweden (33 studies), Italy (32 studies), Germany (23 studies), Norway (22 studies), Ethiopia (21 studies), India (21 studies), Spain (21 studies), France (20 studies), South Sudan (19 studies), Finland (16 studies), New Zealand (13 studies), South Korea (13 studies), South Africa (12 studies), Ireland (11 studies), Belgium (10 studies), Japan (10 studies), Switzerland (10 studies) and Taiwan (10 studies). The following countries were included in fewer than 10 primary studies: Afghanistan, Argentina, Austria, Bahrain, Bangladesh, Bolivia, Brazil, Burkina Faso, Cambodia, Czech Republic, Chile, Colombia, Democratic Republic of Congo, Denmark, Djibouti, Dominican Republic, Estonia, Egypt, Ghana, Greece, Haiti, Hong Kong, Hungary, Iceland, Indonesia, Iran, Iraq, Israel, Jordan, Kenya, Kuwait, Latvia, Lebanon, Malawi, Malaysia, Mexico, Nigeria, North Macedonia, Oman, Pakistan, Palestine, Papua New Guinea, Philippines, Portugal, Rwanda, Russia, Samoan Islands, Saudi Arabia, Senegal, Singapore, Slovakia, Slovenia, Sri Lanka, Syria, Tanzania, Thailand, Turkey, Uganda, United Arab Emirates and Yemen. We were unable to identify some of the countries included in some systematic reviews [2,35,52,67], nor determine the exact numbers of primary studies conducted in certain countries [29,44,59].

Methodological quality appraisal of the included systematic reviews

Figure 2 summarizes the results of the critical appraisals of the included systematic reviews. The quality of most of the systematic reviews (42 out of 45) was considered of "critically low" quality, while the remaining three (3 out of 45) were classified as "low" quality, according to the AMSTAR 2 guidelines.

Adoption factors (facilitators and barriers) of DHTs

The adoption factors extracted from the 45 reviews were classified using the modified NASSS framework (Supplementary Appendix D). The frequencies of citation of each adoption factor are presented in Figure 4.

Domain 1. Condition

1A nature of condition or illness. This subdomain questions the nature of the condition or illness [16]. A systematic review [29] reported that, for better DHT adoption, the adopter's health condition is preferable to be *stable (or chronic) and fully understood* by the DHT developer [29]. Possible condition-related characteristics that may limit DHT adoption include various factors such as hearing loss, poor vision, language limitations, loss of dexterity, severe fatigue, pain, cognitive impairment and severe anxiety or depression [2,31,32,36,42,45–47,53,55,57].

1B comorbidities, sociocultural factors. This subdomain addresses the comorbidities and sociocultural aspects of the condition related to DHT adoption [16]. The evidence regarding *age, sex* and *education/literacy levels* was unclear in the identified systematic reviews. *Older ages* appear to negatively influence DHT adoption compared to younger ages, as older individuals demonstrate less engagement in DHT activities, lower acceptance of DHT, reduced understanding of DHT functionality, lower e-health literacy and limited access to DHT compared to younger people [31,32,36,46,54,58,61,66,71]. However, one systematic review [52] reported that the impact of age was inconsistent across the primary studies. *Women seem to* be more active DHT users than men [2]. However, other reviews noted that women are less likely to accept electronic symptom self-reporting systems [32], socially assistive robots [54], or DHTs in general due to their priority being domestic tasks and inequities in DHT access [60]. A systematic review has also reported such inconsistency [52]. *Higher education or literacy* would be positively related to some aspects of DHT adoption [32,36,47,50,54,60,73], yet a systematic review [52] reported that the impact of education level on DHT adoption was inconsistent. *The white race* was associated with higher acceptance and DHT use [32]. *Cultural and linguistic barriers* contribute to the challenges of DHT adoption [60,69]. *Living in urban areas* and belonging to *higher social classes* may positively influence DHT adoption and *e-health literacy levels* compared to *those living in rural areas* and *lower social classes* [2,36,46,47,50,57,61,69,73]. *The level of engagement with digital technologies* was reporeted to be another factor influencing DHT adoption [32,42,50,67].

Domain 2. Technology

2A material features of technology. This subdomain looks up the material and technical features of the technology [16]. Many systematic reviews identified that *ease of use of DHT* (user-friendliness, low cognitive load required, ergonomics) are a facilitator for the DHT adoption [74]. *Ease of use* includes a simple installation (e.g., off-the-shelf, preinstalled solution) [29,31], easy handling [31], design factoring in disabilities [59], using verbal communication rather than writing [54], human-computer interface improved by visual information guiding clinician to timely and appropriate care [66], a small size [2,31,53,59], waterproofness [53] and comfort [53,72]. On the contrary, *limited usability* (lack of user-friendliness [2,31,37,38,42,43,47,48,50,52,53,58,60–62,65–69,71,72], being too bulky [62], small-sized screen [66], complicated configuration setting [2]) has been reported as an obstacle to DHT adoption. *Esthetic features,* including visual appeal [2,35,53,57,60,66,72], human-like facial appearances and vocal quality for socially assistant robots [54,59], were favorable to adoption. On the contrary, a medical look [53] was less appreciated by the patients. *The customizability* of DHT [2,31,42,43,47,48,50,52,53,55,58–60,64–66,70,72], including *the ability to modify the design or features*, such as personalizing services to adapt to users' care needs [59], expanding medical information texts [58] and increasing the difficulty level of exergaming, was considered facilitating. *The interoperability with other technologies—the ability of different systems to communicate with each other to provide the intended services* [75]—is also essential to consider when implementing a DHT [2,29,31–33,35,41,44,53,57,62,63,66,69]. Especially when a digital infrastructure, such as electronic health records, is already in place [44], the DHT to be implemented must be compatible with it. *The suitability of DHT* to the adopting environment or everyday life has also been deemed critical [2,31,36,37,57,62,65,72]. If the device is not suited to the home and it needs to be moved around the home [31], or not suitable for everyday life since the DHT use takes a lot of time, limiting a time for other aspects of life [37], the DHT is unlikely to be adopted. *Poor dependability* or *lack of reliability* of DHT [2,29,31,33,43,59,63,66,68,69,72] and unbalanced *human-DHT interactivity* (balance between the manual function done by the user and the automated function performed by the DHT [60,75]) have also been identified as essential factors for DHT adoption [32,54,55,60,67]. When the DHT is supported by artificial intelligence, the adopters expect that DHT learn and improve its functions; otherwise, the sustainability of its adoption would be threatened [59,66].

2B type of data generated. Question 2B considers "the knowledge generated or made visible by technology" [16]. *The relevance of data or information* generated by DHT is essential for DHT adoption [2,31–33,35,37,42–44,47,52–54,58–61,63,66,70,72]. For some patients, cultural relevance [2,60] is paramount; for others, information that improves self-management of health condition [42,60] is considered relevant (e.g., DHT-use reminder [37], appointment reminder [54], activity parameter tracking [42,53], goal attainment [42], health information [60]). *The reliability of generated data* [2,29,41,42,52,60,63,69] and the *novelty of information* [2,37,42] are also essential for the DHT to be accepted. Overly negative feedback [31], contradictory advice between healthcare professionals and DHT [42], untailored content [42], an overfocus on medical information [60], lack of reliability of data or information [2,29,34,35,41,43–45,48,51,53,60,66,67] and repetitive content [60] were barriers to DHT adoption. *Comprehensibility or readability of data* (providing concise information [37,42,61,64,66], using plain and first language [33,37,54,60,61,72] or audio-visual information [31,42,54,60,61]), as well as the timely *availability of information,* would facilitate DHT adoption. In contrast, the use of

medical jargon, complex information [37,42,64], excessive information [32,37,42,58,60,72], limited access to data and poor timing [34,42,60–62,66,68,72] were identified as obstacles.

2C knowledge and support required to use DHT. Question 2C addresses "the knowledge and support needed to use the technology." Many systematic reviews report that *technical support* [2,29–31,35,36,41,42,44–46,50,52,53,55,60–63,66,69], *training for DHT use* [2,29–31,34–36,41,43,44,46,47,50,52,56,60,61,63–66,69] and *providing support materials* such as written or video instructions [2,29,30,34,47,50,53,55,61,69,70] are facilitators for adoption. Conversely, the *lack of adequate technical support* [2,31,36,42,66,69,72], insufficient *training* [36,41,48–50,65,66,69,71] and the absence *of proper support materials* [33,53,66] are recognized as barriers. *Access to DHT* [2,30,32,36,37,41,42,45–47,49–51,56,57,60–63,66,68–70], along with *a stable high-speed internet connection* [2,30,32,33,36,37,41,43,45–51,56,60–62,66,68,69,71–73] and *electricity* [50,57,66] are prerequisites for DHT use, as is *durable battery* for wireless DHTs [53,66,72]. Smartphone applications and short message service (SMS) interventions (mHealth) have demonstrated better reach to people than website interventions [38,39,60], as more individuals have smartphones than computers.

2D technology supply model. This subdomain examines "issues for sustainability raised by the technology supply model" and "how the technology was procured, the nature of the client-supplier relationship and the level of potential substitutability *via* the marketplace" [16]. *Availability in required or local markets,* along with *an off-the-shelf supply model that demands minimal software customization* and allows *trialability* of DHT [64] (i.e., the opportunity for experimentation [76]), were considered as factors influencing DHT adoption.

Domain 3. Value of proposition

3A supply-side value (to developer). This subdomain considers "upstream value, which follows the supply-side logic of financial markets and investment decisions." *Economic benefits*[29,68] and *unrestrictive intellectual property supported by open-source frameworks* [50] would facilitate DHT adoption. Conversely, an *underdeveloped value proposition* [29] and *restrictive intellectual property ownership* [33,66] would hinder DHT use.

3B demand-side value (to user). This subdomain reports on "downstream value, which follows the demand-side logic of health technology appraisal, reimbursement, and procurement" [16] and "relates to evidence of benefit to patients and real-world affordability" [16]. The *desirability of DHT* is extensively discussed in nearly all systematic reviews. Patients and caregivers perceive DHTs as desirable if they can improve the patient's quality of life [2,40,52,70], bring enjoyment [31,59] and satisfaction [38], enhance patients' autonomy and enpowerment [2,33,40,44,54,61,66,70,72], improve access to care [2,32,42,44,47,58,60,66] and communication with others (healthcare providers, family members and peers) [33,40,50,61,69,70], thus their relationship [2,32,47]. Healthcare providers would consider DHT valuable when it improves their knowledge [44,50,61,66], their quality of care [32,34,35,44,45,50,57,65,66,69], multidisciplinary communication and sharing information [33,61,66,69]. On the other hand, the undesirability of DHT impedes its adoption [2,42,53,60,62], such as negative impacts of DHT use on quality of life [72], resulting in stigmatization [53], deteriorating relationships with family or healthcare providers [2,36,47], lack of face-to-face contact with healthcare providers [32,33,40,44], concerns about quality of care [30,34,40,43,57,62,65,67] and increased workload for heathcare staff [63,66]. DHT *effectiveness* is perceived by *reduced traveling, wait time for consultation* [40,44], or *staff burden* [33,40,45,63,66,67,72] and this positive perception would favor its adoption, while *lack of effectiveness* consists of obstacles [2,30,33,47,62,63,66,71,72]. *DHT cost-effectiveness and affordability* [2,29–31,34,38,41,44,50–52,54,57,60,61,63,66,67,69,70,72], *DHT safety* (including data security and privacy) and free of ethical issues (e.g., conflict of interest), are frequently reported as DHT adoption factors [2,33,34,36,37,40,41,43,44,46–48,50,52,54,57,60,61,63,65–68,70–72,77].

Domain 4. Adopters

4A staff. This subdomain is about "changes in staff roles, practices, and identities are implied" [16]. As suggested in the introduction, we have also incorporated the self-determination constructs (motivation, competence and relatedness with others) into this subdomain. *Staff motivation* [30,36,43,47,50,57,63–68,71], *staff competence* in using DHT (expressed as self-efficacy, prior experience of DHT use, digital literacy) [29,30,32,34–36,40,41,44,47,49,50,57,61,63,65–71] and *staff relatedness with others (colleagues, patients*) [36,47,69,71] have been reported to influence DHT uptake. *Changes in staff roles, practices and identities due to DHT implementation* may pose obstacles to its adoption, particularly when the workload increases (e.g., through constant remote monitoring and troubleshooting) or their professional role is threatened [29,33,34,36,41,42,47,48,57,64,69].

4B patient/client (and/or immediate caregiver). This subdomain addresses "adoption by patients or clients, including acceptance and the work required of them" [16]. As for the subdomain 4A Staff, we propose to

include the self-determination constructs (motivation, competence and relatedness with others) in this subdomain. Numerous systematic reviews have reported that these factors influence DHT adoption (motivation [2,29,33,36,42,47–50,52,53,56,57,60,69,70,73], *competence* for using DHT [2,31,32,36,37,41,42,45–48,52–57,59–63,68,70,72,73] and *relatedness with others* [2,30,31,36,37,40–43,45,48,52,53,57,59,60,63,68,70,71,73]). Additionally, *simple tasks expected of patients and caregivers during DHT use* (e.g., logging in, entering data, or engaging in online conversations) were facilitators and *more complex requirements,* such as goal setting that may demand immediate caregiver support or increasing screen time, could present obstacles to DHT acceptance [29,40,72].

4C lay caregivers. This section focuses on "the assumptions that may be built into the technology (or the linked service model) about the availability and behavior of lay caregivers" [16]. One systematic review [29] stated that *caregiver input* for DHT adoption was not essential, whereas another [31] reported that assistance from family members was necessary.

Domain 5. Organization

5A organization innovation capacity. This subdomain tackles "the organization's capacity to embrace any service-level innovation" [16]. Sufficient resources [36,61,63,64], champions' involvement [34,35,44,46,47,61,64,66] and supportive management [44,46,61,69] have been reported as facilitators, while a lack of material, human and financial resources are obstacles [35,36,41,43,44,48,49,51,61,64–66,69,71].

5B organization readiness for DHT adoption. This section concerns "the organization's readiness for a specific DHT" [16]. Organizational recognition of added DHT value, organizational readiness for using existing infrastructure and managerial support for the shift favor DHT adoption [29,30,36,38,46,47,50,57,61,64–69]. Unreadiness for change to liberate staff, opposing organization culture and lack of trust toward DHT limit the adoption [29,33,36,42,43,49,61,63–66,68,69].

5C organization nature of adoption and funding decision. Question 5C addresses "the adoption decision, typically a board-level decision to allocate a budget line to support a particular technology" by questioning "how easy the adoption and funding decision be" [16]. Partnership and collaborative networks are reported to be a facilitator [29,30,33,44,50], yet the implication of multiple organizations may complicate the implementation process [29,43–45].

5D organization extent of change needed to routine. This section considers "the extent to which established work routines will be disrupted or made too brittle by the new technology" and the necessary changes (team routine or care pathways) [16]. When a DHT is aligned with existing workflow, it is more likely to be adopted within the organization [30,36,44,48,63,65,66,68]. However, if a DHT interrupts the workflow, it will likely be rejected [29,30,35,36,44,50,57,61,62,65,66,71]; otherwise, *a new workflow* must be established [46], integrating evidence-based standards and guidelines for the DHT into practice [69]. Establishing new reimbursement models is also necessary and incentives/rewards would motivate adopters to use DHTs [36,50,63,64,66,69,71].

5E organization work involved in the implementation. This section explores the organization work and individuals involved in the implementation process [16]. Several reviews have documented the necessary work for successful DHT implementation. These include offering a supportive environment and supervision for implementation [68], assisting healthcare providers and patients in expanding their skills and roles to meet care needs [66], establishing a transdisciplinary team of data scientists, healthcare providers and information technology leaders to develop DHT capabilities across domains (contingent on the deployment of artificial intelligence) [34], facilitating cross-sector sharing of patient information among healthcare providers involved in their treatment [33] and conducting quarterly performance review meetings [50]. Numerous reviews highlight the importance of hiring a dedicated full-time coordinator for telehealth services to prevent increasing the workload of healthcare providers [35,41,44,46,48,69], hiring additional staff to support post-in-call hub clinicians [30] and identifying a clinical champion to advocate for the DHT [34,36].

Domain 6. Wider systems

6A political, economic, regulatory, professional and sociocultural context. This domain relates to the broader institutional and sociocultural context, which is often crucial in explaining why organizations fail to transition from successful demonstration projects—typically reliant on specific champions and informal workarounds—to fully mainstreamed service that can scale, spread and sustain over the long term [16]. Key factors influencing DHT implementation in this domain include legal, financial or intellectual support from the government, local and international organizations and private health insurances [29,30,34,47,50,51,56]. Additionally, establishing comprehensive legislative plans and policies—covering data security, privacy protection, liability, funding mechanisms, reimbursement and intellectual property ownership—is essential [33,50,68]. Other critical aspects involve the integration of DHT into the healthcare system [50,69],

the pressure of external policy (e.g., governmental lockdowns due to a pandemic driving telemedicine adoption) [46,64] and standardizing telemedicine practice [30]. Implementation challenges include limited support from the healthcare system or local organizations [30,36,42], lack of precise regulation and policies [29,30,36,43,50,63,67,68,71], absence of reimbursement systems for DHT use [29,35,41,44,63], coordination issues within the healthcare system [50], corruption and abuse [50], inadequate or damaged healthcare facilities [49,51] and unequal medical and technological resource distribution [48]. The reported *sociocultural factors* influencing DHT adoption include social influence (e.g., recommendations from medical associations, ageism) [36,46,50,52,53,55,57,59,64,66,67,69], lack of evidence to guide telemedicine designs [48,71], raising public awareness of telemedicine [68], or conversely, a lack of awareness of DHT among potential adopters [33,35,48,68] and a limited digital information culture [50,60].

Domain 7. Embedding and adaptation over time

7A scope for adapting and coevolving the DHT and the service over time. This subdomain relates to "the medium- and long-term feasibility of continuing to adapt the technology and the program" [16]. A strong scope of adapting and embedding the DHT as local need or context change from the beginning of implementation planning is necessary [16]. It would be ensured by careful planning of the implementation procedure [44], engaging potential DHT adopters to understand their needs, expectations and perception [29,44,46,52,60,62,63], using clear communication [46], planning a gradual transition process (e.g., reviewing the academic literature, planning a DHT trialing period before its implementation, cybersecurity testing, providing training, planning for post-trial sustainability) [30,33,34,63], a thorough examination of the technological, environmental and social context (e.g., site-specific workflows, available resources) [62,63] and minimizing implementation costs [63] and monitoring and evaluating DHT use (e.g., frequently soliciting user feedback, using validated tools and frameworks) after implementation [30,34, 44,62,63]. Developing cultural competence is crucial when cultural diversity is present (e.g., understanding the histories and traditional languages) [61]. On the contrary, barriers to DHT adoption include insufficient long-term implementation planning [36,64], exclusion of potential end-users from the implementation process [50] and the perception among healthcare providers that DHT is developed for research purposes rather than permanent adoption, which disrupts clinical routines.

7B organizational resilience. This subdomain concerns "organizational resilience, and particularly (…) reflexive monitoring and (…) macrocognitive functions of sense-making, including, in particular, the ability to detect critical events or issues and respond to these through coordinated action" [16]. The factors that can increase such resilience reported are formulating a backup plan [30] and offering solutions (e.g., resources) [29].

Discussion

Main findings

This rapid review of systematic reviews aimed to identify the DHT adoption factors using the NASSS framework [16], in which the self-determination factors [19,20] were integrated. More than half of the systematic reviews recognized the following factors as adoption facilitators: *DHT ease of use*, *training for DHT usage* and *access to a high-speed internet connection* (classified in Domain 2), the *demand-side value of DHT* (its desirability) and *safety* (Domain 3), *patient competence* (Domain 4), as well as *favorable political, economic, regulatory and professional contexts* (Domain 6). *Providing technical support, adopters' access to DHT, DHT customizability*, *relevance and reliability of DHT data* (Domain 2), *cost-effectiveness* (Domain 3), *staff competence* and *patient relatedness with others* (Domain 4), *organization readiness*, *necessary changes in team routines and capacity to innovate* (Domain 5), as well as *favorable socio-cultural contexts* (Domain 6), were acknowledged as facilitators by over 40% of the systematic reviews. The findings confirm the importance of considering micro, meso and macro-level factors for the optimal outcome of DHT implementation. This is in line with the findings of an overview of systematic reviews regarding DHT use across the World Health Organization European region [78]. Their findings showed that the DHT adoption factors found at the micro level (individual domain), at the meso level (organizational and clinical domains) and at the macro level (socioeconomic and sociocultural aspects, regulatory concerns about ethics/security and privacy issues).

Most primary studies included in the identified systematic reviews were conducted in Western countries, with a prevalence in the USA, Australia, Canada and European countries, with some exceptions, such as China, Ethiopia, India and South Sudan. As DHT implementation is resource-intensive, high-income economy countries are far more favored in developing and implementing DHTs. As DHT could improve universal access to healthcare [1], the international community should invest digital health infrastructure in the low and lower-middle countries.

Methodological quality appraisal of the included systematic reviews

The quality of all the included systematic reviews was deemed "critically low," except for three that were categorized as "low." These results align with the aforementioned overview of systematic reviews [78]. In this overview, the methodological quality of 29 out of 33 systematic reviews was "critically low," while the remainder were rated as of "low" quality. The frequently unmet criteria included items 2, 3, 4, 7, 8 and 10, which align with the findings of this rapid review. None of the systematic reviews conducted meta-analyses on DHT adoption, as none of the studies included in the overview by Saigí-Rubió et al. conducted meta-analyses [78]. This is probably due to the absence of measuring implementation measures in their primary studies. As quantitative implementation measures have become widely available [79–81], these studies should have quantified their DHT adoption level. Integrating the robust methodology applied in effectiveness studies, such as randomized controlled designs and measuring adoption rates, needs to be applied in implementation trials. On the other hand, the systematic reviewers including implementation studies should also heighten their methodology quality of their reviews.

Relevance of including the self-determination factors in the NASSS framework

In this rapid review, we proposed including the *self-determination factors* [19,20] in Domain 4 Adopters of the NASSS framework. Indeed, for Subdomain 4A (staff), 44.9%, 30.6% and 8.2% of the included systematic reviews identified *competence, motivation* and *relatedness* as positive adoption factors, respectively, while for Subdomain 4B (patient), 59.2%, 36.7% and 42.9%. These findings thus validate the relevance of integrating the *self-determination* factors into the NASSS framework. The inconsistent findings of the factors (age, sex, education level (Subdomain 1B), as well as availability of lay caregivers (Subdomain 4C)) about their contribution to DHT adoption may be explained by the larger impact of the adopters' self-determinant factors on DHT adoption.

Clinical implication – development of a checklist for DHT adoption

To make our findings readily applicable for future DHT developers or implementers, we propose a checklist presented in Table 2 which would help them examine which factors need to be worked in their planning.

Suggestions for future research

Although we have proposed DHT adoption checklist, il must be empirically validated and regularly updated, as DHTs continue to evolve rapidly. Furthermore, the DHT adoption checklist should be refined to reflect specific contexts of DHT adoption, as this rapid review included diverse systematic reviews across various populations (e.g., different health conditions, patients vs. staff), various DHT types (e.g., Tier B vs. Tier C), various contexts (e.g., community vs. healthcare systems) and divers countries (e.g., varying income levels and continents). In addition, the findings of this review suggest that quantitative measures of DHT adoption are not commonly practiced, in contrast to effectiveness trials, which quantitatively assess the effectiveness of interventions. Future DHT implementers should adopt such practices to objectively document the extent of DHT adoption, subsequently improve their methodological quality.

Strengths and limitations of this review

This review's strength lies in its novel approach, incorporating the self-determination factors (motivation, competence and relatedness with others) into a comprehensive DHT adoption framework, the *NASSS framework* [16]. This approach allowed us to examine various DHT implementation factors' levels (micro, meso, macro). The proposed checklist, grounded in the NASSS framework [16], Self-Determination Theory [19,20] and the findings of this rapid review may be a useful tool to assist future developers and implementers of DHT in successfully adopting the technology. Several limitations of this rapid review are as follows. Its methodology was not as rigorous as that of umbrella reviews [25]. Firstly, the protocol for this review was not registered *a priori*. Secondly, the records were screened by a single individual (the first author), although both the first and third authors subsequently validated the eligibility of the potential reports. Furthermore, data extraction was also performed solely by the first author. Consequently, this review may have overlooked some relevant records and relevant data. Additional limitations are associated with the included systematic reviews, which exhibited methodological weaknesses, thereby limiting the overall validity of this review.

Table 2. A checklist facilitating digital health technology (DHT) adoption.

Domain 1: the condition or illness	
1A. The nature of the condition or illness	• The nature of the condition or illness is well-characterized, well-understood and predictable (e.g., hearing loss, poor vision, linguistic limitation, dexterity loss, fatigue, pain, cognitive impairment and anxiety/depression).
1B. The relevant sociocultural factors and comorbidities	• The relevant sociocultural factors and comorbidities are unlikely to affect care significantly; OTHERWISE, • Suppose these factors are obstacles to DHT adoption (e.g., cultural and linguistic barriers, low engagement with digital technologies), strategies should be developed to overcome the obstacles (e.g., augmenting cultural and linguistic relevance, increasing DHT value to motivate the DHT use).
Domain 2: the technology	
2A. The key features of the technology	• The DHT is easy to use (e.g., off-the-shelf, simple set-up, low cognitive load required, ergonomic, design factoring in disabilities). • The DHT is customizable to users' needs (e.g., ability to modify the design, features, or services). • The DHT is interoperable (compatible) with other technologies the adopters use. • The DHT is dependable. • The DHT is aesthetic and appealing (e.g., not a medical look). • The DHT is suitable for the environment in which it is adopted or everyday life. • Human-DHT interactivity is well-balanced. • The DHT can learn if it is supported by artificial intelligence.
2B. The knowledge (data, information) that the technology brings into play.	• The data is relevant to the adopters (e.g., health condition, cultural relevance). • The data is reliable or accurate. • The data is available promptly. • The data is comprehensible or readable (e.g., concise, using plain language, avoiding medical jargon, using first language, including audio or visual information). • The data is novel (not redundant).
2C. Knowledge and/or support required to use the technology	• No knowledge or only a simple set of instructions is required to use the DHT; OTHERWISE, • Training must be provided. • Technical support must be provided. • Support material (e.g., written/video instructions) must be provided. • Prerequisite conditions (access to the DHT, to a stable high-speed internet connection, to stable electricity and to a durable battery if the DHT is wireless) must be met; OTHERWISE, • Access to the DHT must be ensured. • Access to a stable high-speed internet connection must be ensured. • Access to stable electricity must be ensured. • Ensuring the battery is durable if the DHT is wireless.
2D. Technology supply model	• Generic, "plug and play," or customizable, off-the-shelf solutions requiring minimal customization; easily substitutable if supplier withdraws.
Domain 3: the value proposition	
3A. Developer's business case for the technology (supply-side value)	• Developer's business case for DHT is clear, with a strong chance of return on investment (economic benefit). • The DHT is supported by unrestricted intellectual property and open-source frameworks.
3B. The technology's desirability, efficacy, safety and cost-effectiveness (demand-side value)	• The DHT is desirable for potential adopters (e.g., improving patients' quality of life, autonomy, access to care and communication with healthcare providers; bringing enjoyment; improving staff knowledge, quality of care and/or multidisciplinary communication). • The DHT is effective (e.g., reducing traveling or wait-time for health consultation, reducing staff burden). • The DHT is cost-effective. • The DHT is affordable. • The DHT is safe (it does not cause physical, emotional or financial harms). • Using the DHT does not violate ethical issues (e.g., conflict of interest, privacy protection).
Domain 4: the adopter system	
4A. Changes in staff roles, practices and identities.	• DHT implementation will not change staff roles (i.e., staff do not have to learn new skills; no new staff will be appointed; no threat to professional identity, values, or scope of practice and risk of job loss).
Their self-determination (motivation, competence and relatedness).	• The staff feel competent to use the DHT; OTHERWISE, • Support to develop their competence must be provided (cf. Sub-domain 2C). • The staff is motivated to use the DHT; OTHERWISE, • The desirability of the DHT must be demonstrated or reinforced to motivate them (cf. Sub-domain 3B). • Staff relatedness with others (colleagues, patients) is present (e.g., encouragement/support to use DHT).
4B. The tasks expected of the patient/client (and/or immediate caregiver) to use DHT.	• The tasks expected of the patient (and/or immediate caregiver) during DHT use are achievable and acceptable. • The patient (and/or immediate caregiver) feels competent to use the DHT; OTHERWISE, • Support to develop their competence must be provided (cf. Sub-domain 2C).
Their self-determination (motivation, competence and relatedness).	• The patient (and/or immediate caregiver) is motivated to use the DHT; OTHERWISE, • The desirability of the DHT needs to be demonstrated or reinforced (cf. Sub-domain 3B). • Relatedness of the patient (and/or immediate caregiver) with others (healthcare professionals, family, peers) is present (e.g., encouragement/support to use DHT).
4C. Support assumed about the extended network of lay caregivers.	• No support is assumed about the extended network of lay caregivers; OTHERWISE, • Ensuring that a (network of) caregiver(s) will be available when needed.
Domain 5: the organization	
5A. The organization's capacity to innovate.	• The organization is well-led (e.g., optimal leadership, clinical and technical champions involvement, strategic direction). • The organization has slack resources (e.g., financial and human resources). • The organization has good managerial relations (e.g., supportive management and directors, support for streamlining clinical resources and activities). • Risk-taking is encouraged in the organization (e.g., innovation-oriented culture).

(*Continued*)

Table 2. Continued.

5B. Readiness of the organization for this DHT-supported change.	• High tension for change is present in the organization (e.g., recognition of the expected outcomes and added value of the DHT, having knowledge about the evidence regarding technology-based approaches). • The organization has a good innovation-system fit (e.g., readiness using existing technical infrastructure). • The organization shows widespread support (e.g., liberating staff for the DHT adoption, absence of opponents, lack of trust toward the DHT).
5C. Easiness of the adoption and funding decision.	• A single organization with sufficient resources is involved; cost savings is anticipated; and no new infrastructure or recurrent costs are required; OR, • Multiple organizations with partnership relationships are involved; the cost-benefit balance is anticipated to be favorable or neutral and new infrastructure (e.g., staff roles, training) can mostly be found from repurposing.
5D. Changes needed in team interactions and routines.	• No new team routines or care pathways are required (i.e., DHT use is compatible with existing workflow), OR • New team routines or care pathways (new workflow) will align readily with established ones. • New reimbursement models (and/or incentives/rewards) for DHT use must be established.
5E. Work involved in implementation and who will do it.	• Establishing a shared vision of DHT's potential and few simple tasks uncontested and easily monitorable are present; OTHERWISE, • Some work is needed to build a shared vision, engage staff (e.g., telehealth coordinator) to enact new practices and monitor impact (e.g., performance review meetings).
Domain 6: the wider context	
6A. What is the political, economic, regulatory, professional (e.g., medicolegal) and sociocultural context for program rollout?	• Financial and regulatory requirements (covering data security, privacy protection, liability, funding mechanisms, reimbursement and intellectual property ownership) are already in place nationally; OTHERWISE, • locally (e.g., private health insurances). • Professional bodies and civil society are supportive (e.g., medical association recommendations). • Social-cultural contexts favor the use of the DHT (e.g., public awareness of the DHT, favorable digital information culture, anti-ageism).
Domain 7: embedding and adaptation over time	
7A. How much scope is there for adapting and coevolving the technology and the service over time?	• Engagement of all stakeholders (e.g., patients, families, staff, decision-makers, community) to understand their needs, expectations and perceptions. • A thorough examination of the technological, environmental and social context (e.g., site-specific workflows, available resources). • Regular communication with adopters (e.g., emails, visits to implementation sites, educational sessions). • Regular evaluation of the DHT (quality, safety, security) with validated tools and frameworks. • Planning a gradual transition process (e.g., reviewing the academic literature, planning a DHT trialling period before its implementation, cybersecurity testing, providing training and planning for post-trial sustainability). • The DHT is developed for permanent adoption for clinical improvement rather than research purposes which may disrupt clinical routines.
7B. How resilient is the organization in handling critical events and adapting to unforeseen eventualities?	• The organization is resilient by collective sense-making, collective reflection and ongoing and encouraged adaptive action by • Formulating a back-up plan. • Providing further resources to adopters (e.g., increasing bandwidth allocation).

Conclusion

DHTs have been increasingly deployed in the world. This rapid review synthesized the DHT adoption factors extracted from the existing systematic reviews and classified them into the micro-, meso- and macro-level factors using the *NASSS framework* along with *Self-Determination Theory*. The important adoption factors identified in this rapid review include the *ease of use* of *DHT, training for users, access to DHT and high-speed internet*, providi*ng technical support, DHT customizability*, *relevance and reliability of DHT data, demand-side value (desirability),* DHT *safety*, *cost-effectiveness, competence of staff and patient, patient relatedness with others, organizational readiness*, *necessary changes in team routines and capacity for innovation and* the *political, economic, regulatory, professional and socio-cultural contexts*. The proposed checklist grounded in the NASSS framework and Self-Determination Theory may be able to aid future developers and implementers of DHT in successfully adopting the technology.

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